

Scattered points

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Hypernuclei in FLUKA!

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mdbaker@eic0004:flukapro

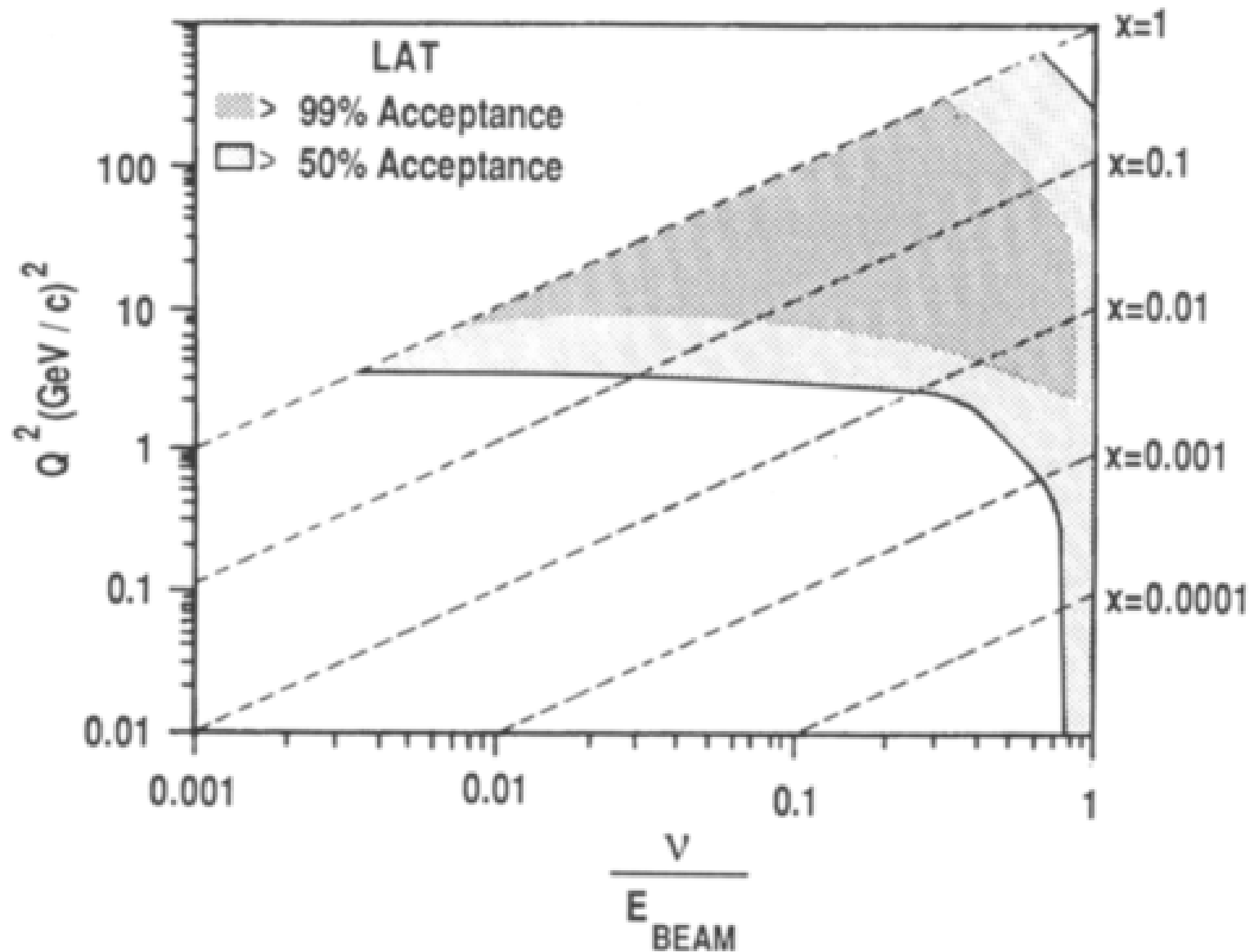
Description of variables (incomplete):

Icres = residual nucleus atomic number
Ibres = residual nucleus mass number
Istres = residual nucleus stable level index
Ismres = residual nucleus isomeric state index
Ihyres = residual nucleus hyperon number
Amnres = residual nucleus nuclear mass
Ammres = residual nucleus atomic mass
Eres = residual nucleus total energy
Ekres = residual nucleus kinetic energy
Px,y,zres = residual nucleus momentum components
Ptrs2 = residual nucleus squared momentum
Angres = residual nucleus angular momentum (GeV/c fm)
Anx,y,zres = residual nucleus angular momentum components
Khyres(jp) = id of the jp_th hyperon in the residual nucleus
Bhyres(jp) = (nuclear) binding energy of the jp_th hyperon
             in the residual nucleus
Icestr = residual nucleus atomic number before evaporation*
Ibestr = residual nucleus mass number before evaporation*
Tvestr = residual nucleus exc. energy before evaporation*
Anestr = residual nucleus ang. momentum before evaporation*
Ichbln = charge balance counter

/afs/rhic.bnl.gov/eic/PACKAGES/fluka-64/flukapro/(RESNUC)
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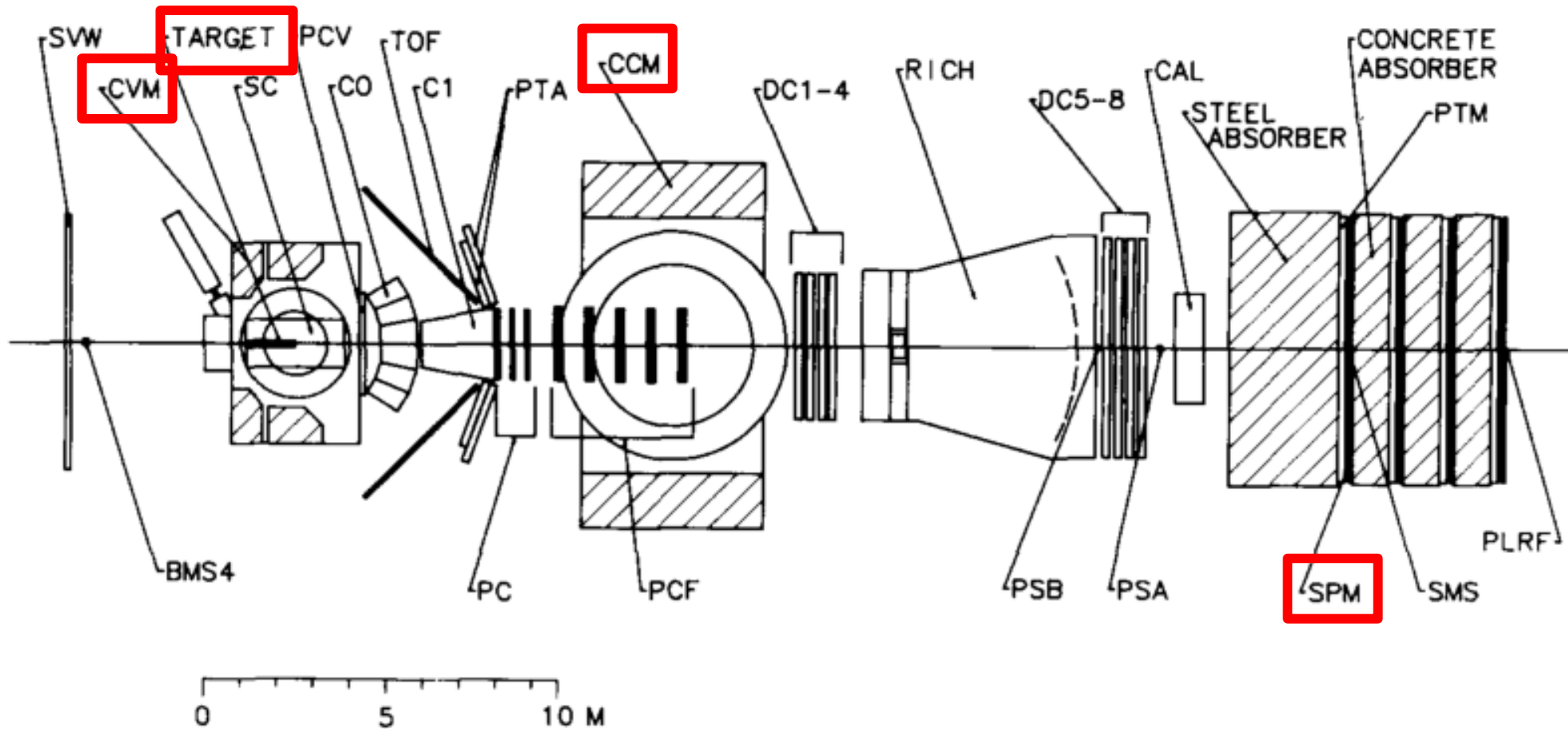
Trigger Acceptance plots are very crude!

E665, NIM A291 (1990) 533-551

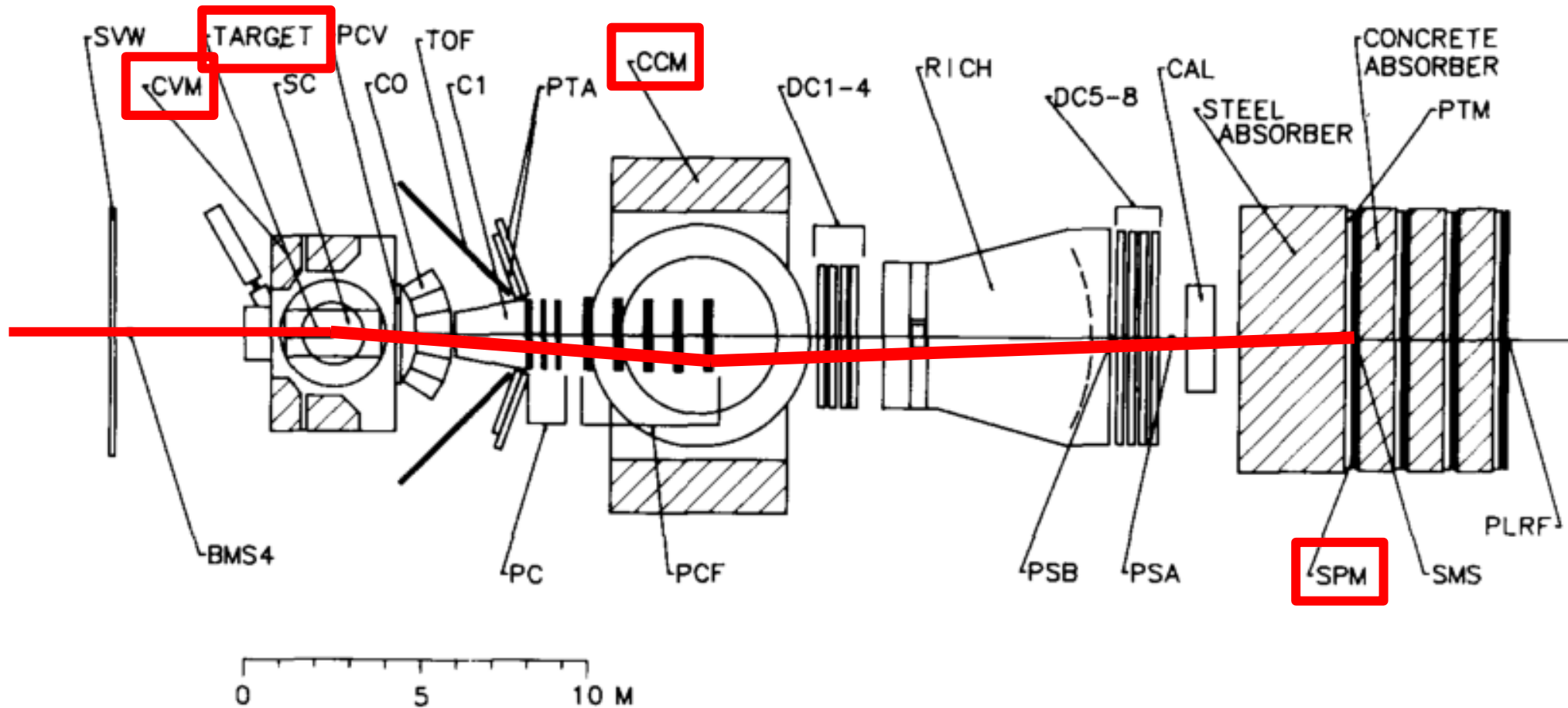


E665 Spectrometer

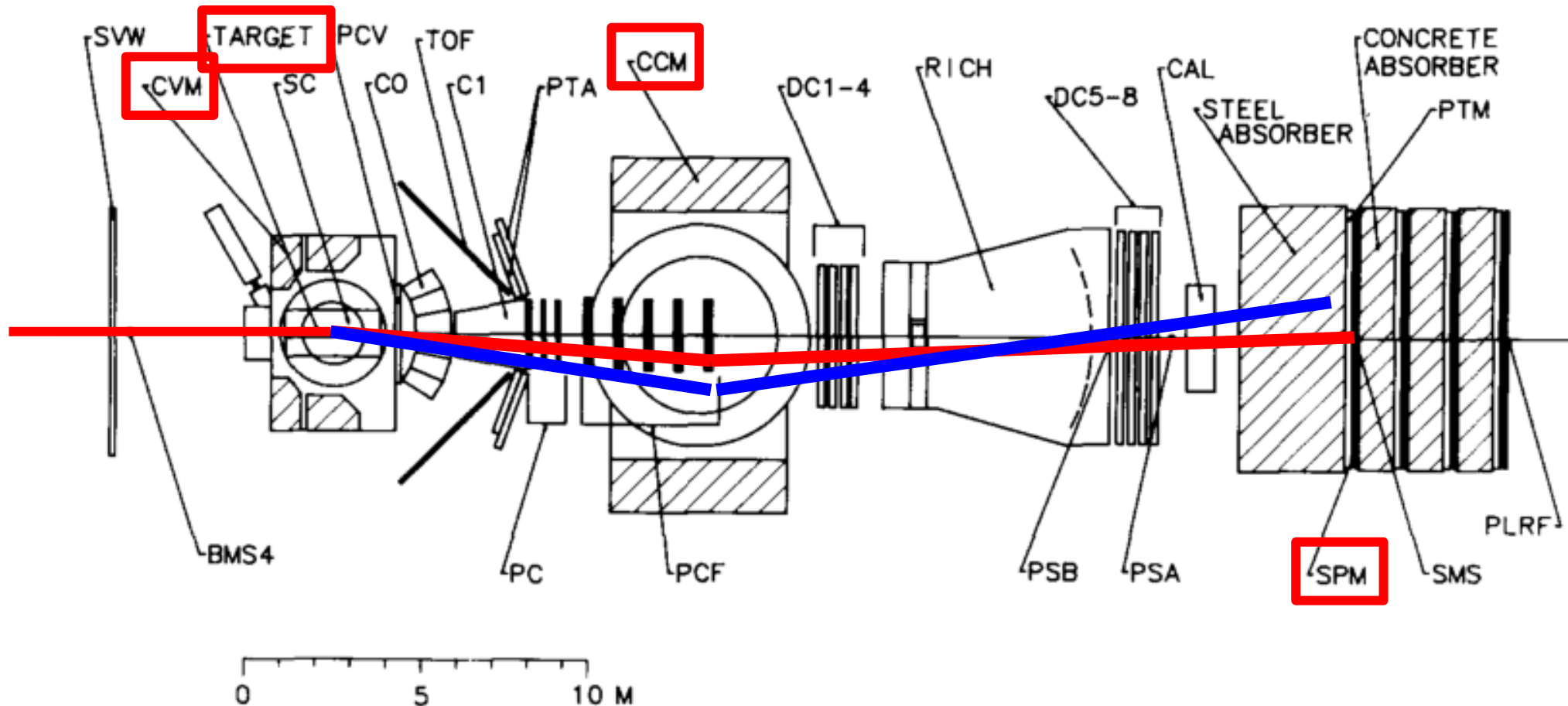
E665, NIM A291 (1990) 533-551



A nonscattered beam is focused



Achromatic effect



A muon which loses a lot of energy (high ν), gets bent more in the second HALF to THREE-QUARTERS of the CVM and gets bent more in ALL of the CCM. It is overcorrected. By looking up the characteristics (ptkick) of the CVM and CCM magnets we should be able to estimate this effect.

Let's calculate...

P_T kick is 300 MeV/Tm – From a book by Jan Rak & Michael Tannenbaum (299.8)?

From NIM:

CVM: $4.315 \text{ Tm} = 1.294 \text{ GeV}$

CCM: $-6.734 \text{ Tm} = -2.019 \text{ GeV}$

CVM is 3.6 m long

Center of target is 1.2 m in

CVM to SPM1 = 29.2m (approximate)

CCM to SPM1 = 18.7m (approximate)

Note: $(4.315 * 29.2) / (6.734 * 18.7) = 1.00$ OK

For a beam particle:

$$\Delta x @ \text{SPM1} = 29.2\text{m} * 1.294 \text{ GeV/p} - 18.7\text{m} * 2.019 \text{ GeV/p} = 29.5\text{mmGeV/p} \\ = 29.5/490 \text{ mm} = 0.06\text{mm}$$

$$\text{Angle error} = 0.06\text{mm}/28\text{m} = 2\mu\text{rad} \quad \text{OK}$$

For scattered muon

$$\Delta x @ \text{SPM1} = 29.2\text{m} * [1.294/3/490 + 2*1.294/3/(490-\nu)] - 18.7\text{m} * 2.019/(490-\nu) \\ = 25.7\text{mm} - 12.56\text{m*GeV}/(490-\nu)$$

$$\Delta\theta_x = 0.918 \text{ mrad} - 0.449 \text{ rad*GeV}/(490-\nu)$$

E665 trigger prescription

Effective θ of the scattered muon should then be

$$\theta_{\text{eff}} = \text{sqrt} (\theta_{\text{xeff}}^2 + \theta_Y^2)$$

$$\theta_{\text{xeff}} = p_x/p + \Delta\theta_x$$

$$\theta_Y = p_Y/p$$

$$\Delta\theta_x = 0.918 \text{ mrad} - 0.449 \text{ rad} \cdot \text{GeV}/(490 - v)$$

Then cut on θ_{eff} instead of θ

Proposal List – lots of ToDo's not yet DONE

Feature added or error corrected	07/2018	12/2018	Planned
1-8. Early BeAGLE features (see previous reports).	YES	YES	YES
9. Shadowing coherence length	NO	NO	YES
10. Partial shadowing effect	YES	YES	YES
11a. Effective σ_{dipole} for J/ψ averaged over x & Q^2	YES	YES	YES
11b. Effective σ_{dipole} for ϕ averaged over x & Q^2	YES	YES	YES
11c. Eff. $\sigma_{dipole}(x, Q^2)$ for $V=\psi, \phi, \rho, \omega$ from Sartre (ePb)	NO	NO	YES
11d. Use correct $R_{dip}(x, Q^2)$ for V from Sartre	NO	NO	YES
11e. Improved σ_{dipole} for V , if necessary	NO	NO	YES
12. Tune to E665 μ A Streamer Chamber data	NO	NO	YES
13. FS p_T for hard process correct	YES	YES	YES
14. Kinematic matching between DPMJet&Pythia	YES	YES	YES
15. Protect against very high E^* values.	YES	YES	YES
16. Enable nPDF with any value of A, Z (EPS09)	YES	YES	YES
17. Extend $R \rightarrow \sigma_{dipole}$ map to more values of A	YES	YES	YES
18. Tune the t distribution for multiple scattering.	NO	NO	YES
19a. Release α version BeAGLE/RAPGAP	YES	YES	YES
19b. Release β version BeAGLE/RAPGAP	NO	YES	YES
19c. Release tested version BeAGLE/RAPGAP	NO	NO	YES
19d. Extend RAPGAP to include e+n (w/ H. Jung)	NO	NO	YES
20. Allow diffraction w/ individual $V=\psi, \phi, \rho, \omega$	YES	YES	YES
21. Cleanup and document BeAGLE work so far.	NO	YES	YES
22. Update Fermi momentum distributions for e+D.	NO	YES	YES
23. Put e+D on mass-shell (light-cone prescription)	NO	Ad-hoc	YES
XX. Implement UltraPeripheral Photon Flux	NO	NO	NO
XX. Tune BeAGLE to UPC data (RHIC &/or LHC)	NO	NO	NO

Table 2. Technical accomplishments and plans through FY2019.

19a. Release α version BeAGLE/RAPGAP	YES	YES	YES
19b. Release β version BeAGLE/RAPGAP	NO	YES	YES
19c. Release tested version BeAGLE/RAPGAP	NO	NO	YES
19d. Extend RAPGAP to include e+n (w/ H. Jung)	NO	NO	YES
20. Allow diffraction w/ individual $V=\psi, \phi, \rho, \omega$	YES	YES	YES
21. Cleanup and document BeAGLE work so far.	NO	YES	YES
22. Update Fermi momentum distributions for e+D.	NO	YES	YES
23. Put e+D on mass-shell (light-cone prescription)	NO	Ad-hoc	YES
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- Successful at releasing BeAGLE and configuring it for a broader developer & user base.
- Significant progress on e+D.
- Delay in RAPGAP implementation.
 - No showstoppers seen.
- Difficulty of tuning to data is unknown.

Key proposal questions

- I think that it takes until at least ~midFY2020 (April 2020) to finish what we already proposed:
 - Tune BeAGLE
- Add more for the last half of FY2020? Include FY2021?
 - eA-physics-driven detector requirements studies?
 - How specific should we be?
 - +???
- Should we ask for more travel funding?

Conclusion

- Lots to do
 - Comparing to E665 & HERMES data
 - Other data a la JH? Which data again?
 - Start a physics paper?
 - Debugging & adding RAPGAP